

Appln No. 09/711,648
Amdt date May 23, 2011
Reply to Office action of December 21, 2010

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Please amend claims 12, 17, 30, 32, 34, and 44.

1. (Previously Presented) An injection catheter comprising:
 - a catheter body comprising a flexible tubing having proximal and distal ends and at least one lumen therethrough;
 - a tip section having a longitudinal axis and comprising a flexible tubing having proximal and distal ends, wherein the proximal end of the tip section is mounted at the distal end of the catheter body;
 - a needle control handle at the proximal end of the catheter body;
 - an injection needle extending through the tip section, catheter body, and needle control handle and having a proximal end attached to the needle control handle and a distal end within the tip section, wherein the injection needle is longitudinally slidable within the tip section so that upon suitable manipulation of the needle control handle the distal end of the injection needle can extend distally beyond the distal end of the tip section in a direction along the longitudinal axis of the tip section;
 - an electrode lead wire having a first end electrically connected to the injection needle and a second end electrically connected to a suitable monitoring apparatus or to a source of ablation energy; and
 - a penetration monitoring electrode fixedly mounted on the injection needle and electrically insulated from the injection needle.
2. (Original) An injection catheter according to claim 1, wherein the first end of the electrode lead wire is connected near the proximal end of the injection needle.

Appln No. 09/711,648
Amdt date May 23, 2011
Reply to Office action of December 21, 2010

3. (Original) An injection catheter according to claim 1, wherein the first end of the electrode lead wire is connected near the distal end of the injection needle.

4. (Original) An injection catheter according to claim 3, wherein the electrode lead wire comprises a pair of wires including a copper wire and a constantan wire that can act as a thermocouple.

5. (Original) An injection catheter according to claim 1, further comprising a protective tube in surrounding relation to at least a portion of the injection needle.

6. (Original) An injection catheter according to claim 5, wherein the protective tube surrounds the injection needle along substantially the entire length of the needle.

7. (Original) An injection catheter according to claim 1, further comprising at least one additional electrode mounted on the tip section.

8. (Previously Presented) An injection catheter according to claim 1, further comprising a tip electrode mounted on the distal end of the tip section.

9. (Previously Presented) An injection catheter comprising:
a catheter body comprising a flexible tubing having proximal and distal ends and at least one lumen therethrough;

a tip section having a longitudinal axis and comprising a flexible tubing having proximal and distal ends, wherein the proximal end of the tip section is mounted at the distal end of the catheter body, the distal end having a distal face;

a needle control handle at the proximal end of the catheter body;

Appln No. 09/711,648

Amdt date May 23, 2011

Reply to Office action of December 21, 2010

an injection needle extending through the tip section, catheter body, and needle control handle and having a proximal end attached to the needle control handle and a distal end within the tip section, wherein the injection needle is longitudinally slidable within the tip section so that upon suitable manipulation of the control handle the distal end of the injection needle can extend distally out the distal face of the tip section in a direction along the longitudinal axis of the tip section;

a penetration monitoring electrode fixedly mounted on the injection needle near the distal end of the injection needle and electrically isolated from the injection needle; and

an electrode lead wire having a first end electrically connected to the electrode and a second end electrically connected to a suitable monitoring apparatus or to a source of ablation energy.

10. (Original) An injection catheter according to claim 9, wherein the electrode is in the form of a ring mounted in surrounding relation to the injection needle.

11. (Original) An injection catheter according to claim 9, further comprising an electrode lead wire having a first end electrically connected to the injection needle and a second end electrically connected to a suitable monitoring apparatus or to a source of ablation energy.

12. (Currently Amended) A method for introducing a therapeutic or diagnostic agent into heart tissue of a patient comprising:

introducing the distal end of a catheter according to claim 1, into the patient's heart;

extending the injection needle distally beyond the distal end of the tip section;

determining whether the injection needle has penetrated the heart tissue by using the penetration monitoring electrode fixedly mounted on the injection needle; and

injecting a therapeutic or diagnostic agent into the heart tissue with the injection needle.

13. (Original) A method according to claim 12, wherein the determining step comprises measuring the impedance across the distal end of the injection needle.

14. (Previously Presented) A method according to claim 12, wherein the catheter further comprises at least one additional electrode at or near the distal end of the tip section.

15. (Original) A method according to claim 14, wherein the determining step comprises comparing the impedance across the distal end of the injection needle to the impedance across the additional electrode.

16. (Original) A method according to claim 12, wherein the therapeutic or diagnostic agent is selected from the group consisting of angiogenesis activators, angiogenesis inhibitors, and antiarrhythmic drugs.

17. (Currently Amended) A method for introducing a therapeutic or diagnostic agent into heart tissue of a patient comprising:

introducing the distal end of a catheter according to claim 9 into the patient's heart;

extending the injection needle distally out the distal face of the tip section;

determining whether the injection needle has penetrated the heart tissue by using the penetration monitoring electrode fixedly mounted on the injection needle; and

injecting a therapeutic or diagnostic agent into the heart tissue with the injection needle.

18. (Original) A method according to claim 17, wherein the determining step comprises measuring the impedance across the electrode mounted on the injection needle.

19. (Previously Presented) A method according to claim 17, wherein the catheter further comprises at least one additional electrode at or near the distal end of the tip section.

Appln No. 09/711,648
Amdt date May 23, 2011
Reply to Office action of December 21, 2010

20. (Original) A method according to claim 19, wherein the determining step comprises comparing the impedance across the electrode mounted on the injection needle to the impedance across the additional electrode.

21. (Canceled).

22. (Canceled).

23. (Previously Presented) An injection catheter comprising:
a catheter body having a longitudinal axis and comprising a flexible tubing having proximal and distal ends and at least one lumen therethrough, the distal end having a distal face;
a needle control handle at the proximal end of the catheter body;
an injection needle extending through the catheter body and needle control handle and having a proximal end attached to the needle control handle and a distal end within the distal end of the catheter body, wherein the injection needle is longitudinally slidable within the catheter body so that upon suitable manipulation of the needle control handle the distal end can extend distally out the distal face of the catheter body in a direction along the longitudinal axis of the catheter body;
an electrode lead wire having a first end electrically connected to the injection needle and a second end electrically connected to a suitable monitoring apparatus or to a source of ablation energy; and
a penetration monitoring electrode fixedly mounted on the injection needle and electrically isolated from the injection needle.

24. (Previously Presented) An injection catheter according to claim 23, wherein the first end of the electrode lead wire is connected near the proximal end of the injection needle.

Appln No. 09/711,648
Amdt date May 23, 2011
Reply to Office action of December 21, 2010

25. (Previously Presented) An injection catheter according to claim 23, wherein the first end of the electrode lead wire is connected near the distal end of the injection needle.

26. (Previously Presented) An injection catheter according to claim 25, wherein the electrode lead wire comprises a pair of wires including a copper wire and a constantan wire that can act as a thermocouple.

27. (Previously Presented) An injection catheter according to claim 23, further comprising a protective tube in surrounding relation to at least a portion of the injection needle.

28. (Previously Presented) An injection catheter according to claim 27, wherein the protective tube surrounds the injection needle along substantially the entire length of the needle.

29. (Canceled).

30. (Currently Amended) A method for ablating heart tissue comprising:
introducing into a heart of a patient the distal end of a catheter as recited in claim 1;
extending the distal end of the needle electrode distally beyond the distal end of the tip section into the heart tissue; [[and]]
determining penetration of the needle electrode by using the penetration monitoring electrode fixedly mounted on the injection needle; and
ablating the heart tissue with the needle electrode before, during or after introduction of a fluid.

31. (Previously Presented) A method according to claim 30, wherein the heart tissue is ablated during introduction of the fluid.

32. (Currently Amended) A method for ablating heart tissue comprising:

introducing into a heart of a patient the distal end of a catheter as recited in claim 9;
extending the distal end of the needle electrode distally out the distal face of the tip section into the heart tissue;
determining penetration of the needle electrode by using the penetration monitoring electrode fixedly mounted on the injection needle;
introducing a fluid through the needle electrode into the heart tissue; and
ablating the heart tissue with the needle electrode before, during or after introduction of the fluid.

33. (Previously Presented) The method according to claim 32, wherein the heart tissue is ablated during introduction of the fluid.

34. (Currently Amended) A method for ablating heart tissue comprising:
introducing into a heart of a patient the distal end of a catheter as recited in claim 23;
extending the distal end of the needle electrode distally out the distal face of the catheter body into the heart tissue;
determining penetration of the needle electrode by using the penetration monitoring electrode fixedly mounted on the injection needle;
introducing a fluid through the needle electrode into the heart tissue; and
ablating the heart tissue with the needle electrode before, during or after introduction of the fluid.

35. (Previously Presented) The method according to claim 34, wherein the heart tissue is ablated during introduction of the fluid.

36. (Canceled).

37. (Canceled).

Appln No. 09/711,648
Amdt date May 23, 2011
Reply to Office action of December 21, 2010

38. (Canceled).

39. (Canceled).

40. (Canceled).

41. (Canceled).

42. (Canceled).

43. (Canceled).

44. (Currently Amended) A method for introducing a therapeutic or diagnostic agent into heart tissue of a patient comprising:

introducing the distal end of a catheter according to claim 23 into the patient's heart;

extending the injection needle distally out the distal face of the catheter body;

determining whether the injection needle has penetrated the heart tissue by using the penetration monitoring electrode fixedly mounted on the injection needle; and

injecting a therapeutic or diagnostic agent into the heart tissue with the injection needle.

45. (Previously Presented) A method according to claim 44, wherein the determining step comprises measuring the impedance across the electrode mounted on the injection needle.

46. (Previously Presented) A method according to claim 44, wherein the catheter further comprises at least one additional electrode at or near the distal end of the catheter body.

Appln No. 09/711,648
Amdt date May 23, 2011
Reply to Office action of December 21, 2010

47. (Previously Presented) A method according to claim 46, wherein the determining step comprises comparing the impedance across the electrode mounted on the injection needle to the impedance across the additional electrode.

48. (Previously Presented) The catheter according to claim 1, wherein at least a portion of the injection needle comprises plastic tubing.

49. (Previously Presented) The catheter according to claim 9, wherein at least a portion of the injection needle comprises plastic tubing.

50. (Previously Presented) The catheter according to claim 23, wherein at least a portion of the injection needle comprises plastic tubing.